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Abstract

In this paper, we investigate the advantages of email for knowledge management (KM) by undertaking a feature analysis of the email tool Eudora, and a discourse analysis of messages and conversations in an email archive. We believe the advantages of email for KM have contributed to the appropriation of email for everyday knowledge work. We provide a table of the characteristics of KM in email, an analysis of knowledge development and creation in email, and an understanding of the considerable advantages of email for knowledge work. Our results may prove useful to companies in suggesting objectives, features and managerial interventions for other KM tools and endeavours. The research findings also provide support for the recognition of email in formal organisational KM strategy.

Keywords

Knowledge management, email

Introduction

"*An investment in knowledge pays the best interest.*"

(Benjamin Franklin, 18th century)

Knowledge management (KM) has surely been one of the most enthusiastically received developments in information management and strategy, in recent years. Described by Alavi & Leidner (2001) as the support of the creation, transfer and application of organisational knowledge, KM has promised much in the way of improved efficiencies, effectiveness and competitive advantage. However despite the fanfare, the full potential of KM has yet to be realised, with many businesses having implemented such systems only to see them fall into disuse – the reasons for such failure often remaining a mystery (KPMG 1999, Storey & Barnett 2000, Snowden 2002a).

Nowadays, many experts view knowledge as an holistic system of organisational information, processes, practices, norms, values and beliefs (Davenport & Prusak 1997). Facilitating the capture, creation and sharing of such a complex organisational asset has led to a proliferation of complex systems, typically composed of large numbers of inter and intra-organisational processes, tools, techniques, people and technologies. As is often the case with emerging complex systems, there has been little effective guidance available to businesses as to how to

'get it right'. Once it became apparent that KM systems were not going to be adopted by employees as enthusiastically as originally expected, a number of researchers demonstrated that the obstacles lie in the social, organisational, business and human issues, rather than in the technology itself (Alavi & Leidner 2001, Thomas, Kellogg and Erickson 2001, Von Krogh, Ichijo & Nonaka 2000). As a result, researchers and practitioners alike have attempted to find new and improved ways to: motivate less-than-keen employees to become knowledge workers; identify new and more effective knowledge processes; represent knowledge in more reusable forms; and generally force, through artificial and often complicated means, a myriad of desired improvements (Hahn & Subramani 2000, KPMG 1999, Romaldi 2002).

One of the most common excuses employees proffer for their lack of participation in implemented KM schemes is insufficient time to participate (Davenport & Beck 2001), although the Delphi Group (2002) reported that, interestingly, employees spend 30% - 50% of their time searching for actionable knowledge of one form or another, with 60% - 80% of these efforts failing. This 'lack of time' suggests a need to integrate KM with daily work practices, and to accord with Davies, Fensel and van Harmelen's (2002) vision of KM as "efficient, natural and intuitive".

Our research focuses on one commonplace, everyday organisational environment in which, we suggest, "efficient, natural and intuitive" knowledge work regularly occurs – email. In support of our contention, recently Ducheneaut & Bellotti (2002) observed the phenomenon of selected, protracted email conversations transforming themselves into new knowledge artefacts, and suggested that "*email users draw on the persistence of the medium to make sense of the objects being talked about, and sometimes even transform the conversation itself into an object of conversation*", illustrating this concept with the evolution of a conversation into organisational policy.

Notwithstanding email's longstanding role as an essential communication and collaboration channel in most organisations (Meta Group 2003), email now also comprises a key element in a company's KM armoire (Ducheneaut & Bellotti 2001, 2002), having been found the second most common organisational KM tool after intranets, in 1997 (Alavi & Leidner 1999). In 1998, Lucas highlighted the increasing significance of informal knowledge flows such as commonly occur within email, while more recently, Bontis, Fearon and Hishon (2003) studied the loci of knowledge flows within and between organisations as revealed by email trajectories, arguing for a more formal role for email in KM strategy. Interestingly, Kock's (2000) comparison of knowledge transfer in email and face-to-face conversation discovered higher quality contributions within email, while CIO.com (2001) reported that three quarters of a company's best insight was contained in its email. Finally, perplexing scholars and practitioners alike, email usage has proven far greater than previously predicted by media richness, social influence, channel expansion or other published theories (Bontis *et al*. 2003, Ducheneaut & Bellotti 2002). We argue that a likely contributor to email's largely-unexplained popularity and persistence is the significant knowledge work enabled through its medium.

We were interested in finding answers to the question: How can email help in organisational knowledge management? We felt that such an understanding could help define the role of email in a company's KM strategy, as well as suggest valuable features for other planned KM endeavours. Elsewhere, we have reported on the sustainability of email as a KM tool (Lichtenstein & Swatman 2003). In this paper, we focus upon the features of email which make it an "efficient, natural and intuitive" way to locate, develop and share knowledge.

The remainder of our paper is structured as follows. Following this introduction, we describe our research design. Next, we explore the advantages of email for KM through a feature analysis of email and discourse analysis of conversational fragments drawn from an email archive. A set of characteristics for knowledge work in email – representing the advantages of email for KM – is provided. We then discuss the question of whether there are similar advantages in other popular KM tools, and finally, draw conclusions and suggest future research directions.

Research Methodology

We conducted an exploratory investigation of KM as found within the popular email client, Eudora – analysing its features, and also collecting and analysing *five hundred* consecutive messages, and *three hundred* conversational fragments featuring knowledge development and creation, sourced from the email archive of an academic at a large Australian university.

Feature analysis was employed to identify the KM features of email (Kitchenham & Jones, 1997), while *qualitative discourse analysis* was employed to analyse the messages and conversations. According to Fairclough (1992), a fragment of discourse can be viewed as "being simultaneously a piece of text, an instance of discursive practice, and an instance of social practice" (p.3). The textual dimension can be analysed via qualitative content analysis (for example, Mayring, 2000), thereby identifying recurring patterns and themes. The discursive practice dimension can be explored by examining how texts are produced and understood. The social practices dimension examines how social issues, such as the organisational circumstances of the conversation, affect the discursive practice. Klein and Truex (1995) suggest a fourth dimension – accounting for the wider context of a particular discourse. We analysed our data qualitatively according to these four dimensions, in order to identify relevant themes and trends.

As our data source, we chose an email archive owned by one of the paper's authors, in order to improve our understanding of context, and establish a meaningful frame of reference (Fairclough 1992, Klein & Myers 1999). In this way, participatory observation enhanced our ability to interpret the discourse – while introducing an element of bias. In this paper, we have employed only *one* conversation to illustrate our analysis and findings, for reasons of space.

Following, we discuss the findings from our empirical studies, examining the benefits email can provide as a KM tool. In our descriptions and discussions, we reference relevant literature only in order to highlight scholarly support for our results.

Advantages of Email for Knowledge Management

We found email offered the following advantages for KM, summarised in Table 1.

High likelihood of useful knowledge work outcome

Engaging in knowledge work when there is a higher probability of a positive outcome is likely to be perceived by an employee as an effective use of work time. We found that the knowledge development conversations studied mostly resulted in useful outcomes – in the form of plans, strategies, decisions or other clearly valuable results. Notably, the availability of a complete, comprehensive knowledge development lifecycle (as we describe next)

provided excellent opportunities for facilitating such outcomes. Moreover, the inclusion of decision-makers amongst conversation participants meant there was an extremely high likelihood that outcomes would have immediate, authorised, practical, defensible applications – thereby motivating participants to work toward good solutions, quickly.

Characteristic
1. High likelihood of useful knowledge work outcome
2. Knowledge development lifecycle - *initiation*, *crystallisation*, *sharing*, *qualification* and *combination*
3. Highly attention-attracting
4. Integration of KM with everyday work practices
5. Accessibility and accountability of knowledge workers
6. Cooperation and collaboration
7. Economical involvement of experts
8. Sense-making through contextualisation and personalisation
9. Access to work objects
9. Just-in-time knowledge work

Table 1: Advantages of email for KM

Knowledge development lifecycle

According to the modern view of knowledge-as-interpreted (Galliers & Newell, 2000; Thomas *et al*, 2001; Malhotra, 2002), the creation of knowledge requires individual sense-making. However, such interpretation is not always possible with existing, dedicated KM endeavours. In a recent paper, for example, Wickramasinghe (2002) criticised the absence of knowledge creation involving sense-making in three large consulting firms' KM projects. Email naturally enables sense-making through involving a dialogue between stakeholders, working toward a clear outcome. According to Ducheneaut and Bellotti (2002:2):

> "*email users draw on the persistence of the medium to make sense of the objects being talked about, and sometimes even transform the conversation itself into an object of conversation*".

The authors provide an example of the transformation of a conversation into organisational policy (policies are generally accepted as examples of organisational knowledge). We observed a similar phenomenon comprising knowledge development in the email fragments studied, and identified a pattern to the development and creation of knowledge in email. Turning to the literature, many knowledge development lifecycles have been described, an early example being Nonaka's (1994) seminal SECI model and, more recently, Birkinshaw and Sheehan's (2002) model of four stages: creation, mobilisation, diffusion and commoditisation. We suggest email dialogue naturally facilitates an effective lifecycle, featuring five underlying processes: *initiation*, *crystallisation*, *sharing*, *qualification* and *combination*. This lifecycle is illustrated by the conversation, below:

Ray (*initiation*): "I am planning to teach Subject A next year on week nights, instead of weekends. In order to do that, I need a free week night when there are no other classes for students. Bob, can you swap times with me for Subject B, and teach on weekends?"

Bob (*crystallisation, sharing, combination)*: "I wish I could help, Ray, but I can't do weekends, either. I've been thinking though of changing the teaching for Subject B. I've noticed students don't get much out of Tutorials in Subject B, so I might omit those and have a two hour seminar which I can put on at 4pm. You can then teach three hours of Subject A afterward at 6pm, Ray. What do you all think?"

Author (*crystallisation, sharing, qualification*): "As I recall, Marcia says all postgraduate subjects need three hours of class contact."

Marcia (*crystallisation, sharing, qualification*): "Colleagues, yes, the students like three hours of class contact a week, to provide the understanding they need in the subject."

Ray (*crystallisation, sharing*): "Maybe it is time to look at alternative ways that provide even better value?"

Marcia (*crystallisation, sharing, qualification*): "Well, perhaps Bob can find an innovative way of doing that? Bob, I will leave it to you to come up with something."

Bob (*crystallisation, sharing, combination*): "After some discussions with others about this, I suggest we have a two hour workshop each week at 4pm, and a two day workshop during the mid-semester break."

Marcia (*crystallisation, sharing, qualification*): "Sounds good to me. What do you think, Author and Ray?"

Author (*crystallisation, sharing, qualification*): "Good idea!"

Ray (*crystallisation, sharing, qualification*): "Yup. Thanks, Bob."

We describe the five processes involved, and the outcome of the lifecycle, following.

Initiation

The conversations studied exhibited various types of knowledge initiation, *inter alia*: knowledge claim or assertion, challenge, instruction, link to stored knowledge reference, plan, accusation, question, responsibility assignment, statement of intent, and statement of emotion. Email-based knowledge micro-communities form around an initial message – the knowledge seed – which is inspired by an individual, group or organisational need. This message then becomes part of a knowledge trail consisting of successive, related emails within one or more associated threads, all stemming from the first knowledge seed email.

Crystallisation and sharing

The initial email and its recipients form the first circle knowledge micro-community, a circle which later expands or shrinks according to the needs of participants. Each successive micro-community with whom the next email in that thread is shared, is either informed with the complete knowledge trail by virtue of having been in the circle from the beginning, or receives only those segments passed on to it by earlier circles. However, along the knowledge trail, the knowledge grows and is crystallised by the micro-communities involved as well as by reference to authorities, documents and other knowledge sources. Insights, ideas, suggestions, contextual information and other existing knowledge are shared along the way

by participants. Participants contribute (share) knowledge, which is combined with knowledge-under-construction – *knowledge combination*. Selected participants qualify the knowledge-under-construction – *knowledge qualification*.

Eventually, the knowledge trail concludes when, for example, the needs of the various micro-communities are satisfied, or they simply change priorities, or there is another reason for termination. Aspects of the knowledge trail are now "known and understood" according to individual sense-making, by at least some of the people in the micro-communities involved. At that point, some people who had access to and followed and understood the entire trail, are in possession of all the knowledge represented by that trail. Therefore, knowledge sharing has taken place during and as a by-product of the development of the knowledge itself.

Qualification

Knowledge qualification is a key process occurring within the crystallisation process. We observed incremental knowledge qualification as knowledge progressed from its initiation as knowledge seed through to its final outcome. Schreyoegge (2002) pointed out that in an era of knowledge overload, a person's need to select and, we suggest create only worthwhile (that is, *qualified*) knowledge, becomes important. Schreyoegge posits a question, "Which of the available knowledges are right, reliable and checked, so that an efficient use is possible and makes sense for me?" To this end, Schreyoegge supports the need for a knowledge qualification phase in all KM ventures.

We discovered in our conversations several such qualification processes typically occurring, with key stakeholders repeatedly assessing knowledge-under-construction, involving reflection and evaluation according to often-unspecified, situated criteria, until the forming knowledge was acceptable to (that is, qualified by) all parties. Key stakeholders involved in such qualification fulfilled different roles, *inter alia*: policymakers, involved peers, authorities and decision-makers (for example, managers).

Combination

Knowledge is contributed by participants throughout a conversation, being added to knowledge-under-construction through processes including exclusion, sorting and categorisation.

Outcomes

By the conclusion of the knowledge development lifecycle, there are one or more outcomes. Knowledge sharing has taken place throughout the conversation, while some conversations result in new organisational knowledge in the form of actions, decisions, plans or storage of selected, newly formed knowledge.

Highly attention-attracting

It is common for people in the workplace today to display serious attention deficit, often reserving their attention for high attention-attracting media (Davenport & Beck 2001). Davenport and Beck identified a number of high attention-attracting criteria, many of which are found in email: Email is personalised; emotionally evocative; trustworthy (in respect of receiver ability to 'consider the source'); easy-to-digest; 'captive' environment; social nature;

push technology; high likelihood of immediate recipient benefits. Elsewhere, we have explored in detail these attention-attracting features of email (Lichtenstein & Swatman, 2003). We particularly remark the high levels of 'slightly aversive' (a type of emotionally evocative) attention found in email, considered highly attractive. 'Slightly aversive' attention is attention given because receiver inattention, lack of response, unawareness, or an inappropriate, untimely, inaccurate or tardy response, may lead to negative consequences for the receiver. In summary, then, email garners considerable employee attention.

It seems probable employees would find it cumbersome to shift attention back and forth between media and, indeed, Ducheneaut and Bellotti (2002) found many employees spend almost their entire work days 'living in email'. Employee costs incurred as a result of switching media include not only the time to leave one tool and deploy another, but also the time to retrieve lost train of thought, and manage scattered knowledge. The implications from all this is that employees find it convenient to perform knowledge work in one tool and, indeed, to undertake all their daily work in one place, as we now discuss.

Integration of KM with everyday work practices

Integrating KM with daily work practices eliminates the personal costs for employees of separate attention to knowledge work. Furthermore, in such circumstances, other workers who are in a position to contribute to knowledge development can be directly summoned as part of normal work activities, with a high probability that they will contribute as part of their work obligations – whereas in a dedicated KM system, they may perceive requests for knowledge as requests for which they have no clear obligation, perhaps therefore choosing to ignore them. Clearly, there are advantages to be gained from integrating KM with everyday work practices. Email is an example of a tool which naturally and intuitively integrates KM with normal work practices and business processes:

> *"Email has … become a powerful way to organise one's work and rapidly access work objects."*
>
> (Ducheneaut & Bellotti, 2002: 2)

The following everyday work tasks were observed in our data sample: Email was utilised for activity recording, organising, meeting scheduling, file transfer, referencing of digital work objects, assigning responsibilities and decision-making. Quoting earlier messages was a popular feature, with quoted messages being appended to the end of a new post in order to facilitate understanding through the disclosed history of a conversation. Email clearly provided a complete personal knowledge archive, including personal knowledge trails.

The performance of such everyday work tasks within email was remarked by (Bellotti, Ducheneaut, Howard, Neuwirth & Smith 2002, Ducheneaut & Bellotti 2001; 2002). Email record-keeping as evidence for accountability and legal reasons is also increasingly important (National Archives of Australia 2002), while time and task management are emerging email functions (Gwizdka 2002).

Accessibility and accountability of knowledge workers

In order to obtain benefits from key employee contributions in the location, development or sharing of knowledge – thereby enabling a successful outcome – relevant people must be accessible, and willing to cooperate and collaborate. In dedicated KM projects, experts must

be summoned to assist in knowledge work, and may not feel under obligation to participate, as mentioned earlier. Securing key employee participation (if only observation) directly affects the likelihood of a successful outcome. Therefore, it is important that employees be both accessible and accountable for their participation in knowledge work.

From our study, we found that email ensures key stakeholders in the outcome are accessible and accountable for the knowledge work undertaken. Judicious use of the cc (copy) facility ensured employees were "on view" to people in authority during message exchanges, greatly increasing levels of individual accountability. Furthermore, the expectation with email is that employees are responsible for appropriately handling *all* incoming email. If an email is addressed to an employee asking for his/her assistance, for example, the employee is clearly obliged to read it – and respond, if appropriate. Regardless of whether a response is actually given, the employee in receipt of that email is clearly accountable for his/her decision, as well as for the quality of any response given.

Cooperation and collaboration

Our study highlighted important advantages for needs-driven knowledge development teams, in that there was a clear sense of natural and intuitive cooperative collaborative effort involved in each knowledge-building conversation, culminating in a successful (and therefore productive) outcome. 'Team members' who had been informally assembled in an email conversation (via email direct addressing or copying) shared a common motive, derived from the clear link of the knowledge development to their everyday work needs, activities, responsibilities and duties.

Economical involvement of experts

The involvement of experts was economical for them, in that people were neither summoned nor expected to contribute, until knowledge developed had reached a point where it clearly could benefit from their expert contribution, or a point where their approval was required. People were included in the circulation of messages only when needed and as appropriate, *inter alia*: peers, decision-makers, knowledge experts, administrators and knowledge archivists. This may have enabled key experts with little time and attention to contribute their valuable knowledge or qualification in a timely and economical fashion. Prudent use of the cc (copy) facility assigned experts observer status, and enabled them to keep an eye on knowledge as it was being developed, with little cost (direct involvement) to themselves. Lack of response from an expert who was cc-ed implied consent to the knowledge currently being developed.

Sense-making through contextualisation and personalisation

Context was well provided for in the conversations, through the process of discourse, referencing of work objects (for example, digital documents), and the historicity provided through appended, quoted emails. Participants provided important context about the organisation and group culture, norms and beliefs, business strategy and objectives, political and power structures, authority, relevance, pressures and degree of urgency. Furthermore, when the context provided by a message was insufficient for complete, situated understanding, the recipient requested the missing context by return email.

Collison and Parcell (2001) discussed the need for knowledge workers to "know what, who, where, when and why", about knowledge – in other words, to have access to the knowledge context for *sense-making*, which is needed for the development of situated knowledge, believed to be of high strategic value.

However, there is more to sense-making than simply providing context. Tsui (2002) and others have suggested the need for personal, rather than enterprise, KM tools. In our study, an exclusive email message was usually expressed in terms which the recipient could readily understand, or clarify (via email exchange). Clearly, such exclusive messages appeal to the self-centric interests of recipients, loaning these messages added meaning.

Email clearly offers much in the way of contextualisation and personalisation, for sense-making during knowledge work – as was evidenced in the messages and conversations in our sample.

Access to work objects

When employees engage in knowledge work, they often need immediate access to work objects such as digital documents and web sites. This is facilitated in email through use of attachments and hyperlinks. In our study, work objects were accessed regularly, in these ways.

Just-in-time knowledge work

We found that knowledge work conversations were initiated on a just-in-time, need-to-know basis, with significant benefits obtained through the high probability of immediate application of the knowledge shared or created.

Can Dedicated KM Tools Provide Email's Advantages?

Clearly, it is worth considering whether the advantages email offers for knowledge work are available through popular, dedicated organisational KM tools, such as portals and threaded discussion boards. We discuss examples of why we believe email's advantages are not as readily available through these avenues, following.

Nowadays, the portal is a very popular KM technology solution. Whereas with email, when knowledge is needed others are summoned to assist, a noted disadvantage of portals is the need to search for knowledge through their search engines – often with little understanding of how to couch queries so as to best locate the knowledge required, and with little understanding of the credibility, relevance or other quality of the results returned. There is little in the way of context available in the knowledge repositories associated with portals, so that any information found therein is not situated, needing interpretation for the situation at hand (Wickramasinghe 2002). Email, on the other hand, provides this context readily. There is no opportunity for cooperation and collaboration to take place with portals unless a discussion board, chat facility or other communication tool (for example, email) is provided.

Some portals and other KM systems provide discussion boards for employee communication and collaboration. However, employees cannot be relied upon, in this era of severe employee attention deficit (Davenport & Beck 2001), to frequent these boards and peruse and contribute to discussions, whereas email garners employee attention, as discussed earlier.

Discussion boards usually have many threads, yet a visiting employee would not be able to quickly determine which ones were personally relevant, and certainly would be under no obligation to read any – let alone all – of the threads. Therefore, it would not always be possible to gain access to key stakeholders through a threaded discussion, whereas email reliably enables not only targeted access, but accountability for individual participation. Key decision-makers for the all-important process of knowledge qualification may completely miss relevant threads on discussion boards. Employees often discover these disappointing aspects of discussion boards and reduce or cease posting, eventually leading to the demise of such facilities.

Another example of a popular organisational KM space is the "water cooler discussion". However, key people needed to crystallise, combine and qualify the knowledge-under-construction to a successful outcome may be missing – dispersed at remote locations, or otherwise absent. Because of email's asynchronous nature, however, all relevant parties are accessible as well as accountable for their participation – which, as already mentioned, vastly increases the chances of a successful outcome for knowledge development.

We have illustrated above how email's advantages for knowledge work (Table 1) are missing in some of the popular KM tools, however dedicated KM tools possess advantages for knowledge work which email clearly lacks – most notably, well-defined, structured stored knowledge content; the ability for knowledge workers to share knowledge by depositing it in a structured repository for widespread sharing and reuse; and facilities with which to search the knowledge repositories and retrieve knowledge. A comprehensive study of the advantages of various dedicated KM tools for knowledge work – compared with the advantages of email for knowledge work – is beyond the scope of this paper, however such research may yield useful insights with which to improve email's knowledge work capability, in future.

Conclusion

In this paper, we have reported an investigation of KM in the email client Eudora, in order to understand how email can help in organisational knowledge management. We have provided a table of characteristics representing the advantages of email for KM, and an understanding of these advantages. Although the results are limited to a sample of three hundred conversations and five hundred consecutive emails from an individual archive, and are therefore not generalisable, our findings are indicative of the importance of email as an organisational KM tool – although email is by no means a comprehensive KM facility, as we pointed out in the previous section. We recommend that companies assign email a role in their formal KM strategy, taking into account email's many advantages for knowledge work, described in this paper. We also suggest developers of KM projects may find our set of characteristics useful when developing, reviewing or updating other KM applications, tools, techniques and technologies, although a study of how this could be achieved, given the differences between email and other types of KM tools, would provide more insight into the issues involved.

In another vein, our study also suggests the existence of *consensual, instantial knowledge* – in which the only valid knowledge is that which has been mutually agreed by the parties with the rights (either formal or informal) to qualify the knowledge as situationally (i.e. temporally, group-wise and spatially) valid and immediately applicable. We believe that this type of consensual, instantial organisational knowledge may have important implications. For example, such knowledge will not necessarily possess credibility or understanding outside of

the people who negotiated it, and will therefore need to be linked in some way to the authority of key figures of responsibility – who must be prepared to defend it from contest by others, and to explain it, if called upon. This type of knowledge may also lose validity with time and other situational parameters – even with the members of the community who formulated it – suggesting the dynamic, "just in time" and "one time use" perspective of KM (for example, Malhotra 2002, Snowden 2002b) which we described earlier, as well as knowledge development on a "need to know" basis.

Related to this, we observed that what a company may generally view as static knowledge is not necessarily taken as commonly agreed, but rather is consulted, queried, debated, and sometimes revised, when called into discussion – indicating that even such "static" knowledge is only a starting point for developing a situated form of the knowledge. One must then ask the question as to what "static knowledge" really means, if it can be so readily revised.

Returning to the main theme of this research, and concluding our paper, we suggest that researchers and practitioners examine the various routes that employees naturally choose for their knowledge work, as these are likely to be the paths employees find the most effective. Just as with the early days of information systems it was discovered that users often circumvented new systems if they did not meet their specific requirements, so employees may be avoiding formal company KM systems because they do not meet their needs. Clearly, there are many lessons to be learned from studying business settings where knowledge work *naturally* takes place – as we have done in this paper with the popular organisational tool, email.

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